

SALZ

MAGAZINE FOR STRIP STEEL

No. 7



Electrolytically galvanized steel grades



Welcome!

No doubt you noticed immediately: Our product magazine has a new name and an associated new look. This is part of our new name architecture. We've developed them to help our customers get their bearings among the variety of different types of steel on the market. The new name Sal Z consists of the components "Sal", which represents our Salzgitter location, and the abbreviation "Z", which denotes "magazine" – thereby following our new naming system.

"Sal" is a clear commitment to our company location in Salzgitter. In the future, all of our new highlight brands will bear the Sal abbreviation, so that they can be clearly associated with our company. The new product names are based on the world of trees, because steel and wood have more in common than is generally assumed. We'll provide you with more information on this in our brand brochure, as well as explain our concept in this issue.

In the present Sal-Z-issue, we'd like to introduce you to our electrolytically galvanized steel grades. Salzgitter Flachstahl has continued to invest in electrolytic galvanizing in the course of its continuous improvement in quality and resource efficiency. In line with the motto "wider – thicker – stronger", numerous measures have been taken to expand the range of dimensions and qualities. Now, we are also offering you extremely strong cold and hot-rolled steels in an elo zinc-plated version with a thickness of up to 0.12 in. and a maximum width of 72.83 in.

Innovative design, sustainability and facilitative lightweight construction are among the demands placed on modern products. This motivates us to continually develop our existing steel grades and to enable you to constantly develop new solutions. Much potential remains to be exploited via the targeted design of the zinc layer thickness of our electrolytically galvanized products. The range extends from bake-hardening steels for outer skin parts to dualphase steels, and through to bainitic complex-phase steels. You can look forward with excitement to discovering the solutions that our electrolytically galvanized flat products can offer you.

We wish you enjoyable reading.

Frank Heidelberger
Head of Marketing at Salzgitter Flachstahl GmbH

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SALZ

PARTNER



Durable material diversity

From a local manufacturer of textile filters to one of the world's leading filtration specialists – over the more than 70 years of its corporate history, FILTERWERK MANN+HUMMEL has continuously developed and strongly positioned itself throughout its varied corporate history to become today's MANN+HUMMEL GmbH .

The company's diverse filter products conceal a wealth of materials that are not directly visible yet whose durability has a significant influence on quality. Consequently, for this issue we traveled to the company's headquarters in Ludwigsburg to learn why steel from Salzgitter Flachstahl GmbH and the service focus of Salzgitter Mannesmann Stahlservice are so important for the filtration solutions of MANN+HUMMEL GmbH.



MANN+HUMMEL GmbH

HIGH-QUALITY FILTER SOLUTIONS

The company was founded during difficult times: In 1941, Adolf Mann and Erich Hummel, managing directors of the Stuttgart garment manufacturer Bleyle, acquired the filtration system division of Bleyle knitwear was halted due to the war. In 1941, they founded the filter plant MANN+HUMMEL GmbH and, together with former Bleyle employees, embarked on the production of textile and felt air filters for the vehicle industry.

Production expanded continuously following the war. In 1954, a second factory was set up at the site of the current headquarters in Ludwigsburg, where manufacturing took place in addition to branches in Bössperde and Marklkofen. In 2003, the company was renamed to the present MANN+HUMMEL GmbH.

Today, the company manufactures liquid and air filter systems, intake systems and interior filters. Other products include cylinder head covers made of plastic, as well as filter elements for the automotive industry and the independent aftermarket. For mechanical engineering, process engineering and industrial manufacturing, the product portfolio includes industrial filters as well as membrane filters and systems for water filtration. Today, MANN+HUMMEL GmbH is active in the four business units Automotive Original Parts, Automotive Aftermarket, Industrial Filtration and Water Filtration.

The global orientation of MANN+HUMMEL GmbH is already evident as the interview gets under way: Dietmar Baur, Vice President Purchasing Automotive Aftermarket / Industrial Filtration, and his colleague David Vicente, Director Material Group Steel, are not even sitting in the meeting room in Ludwigsburg in the state of Baden-Württemberg. David Vicente is video conferencing from Zaragoza in Spain.

This does not detract from the informative character of the interview: Both men make very clear steel's importance for the Swabian company in the production of filter products, as well as the fact that related services are also extremely important in the steel production.

Quality through dialog

WHAT MANN+HUMMEL GMBH VALUES IN ITS SUPPLIERS

“For us, there are a large number of criteria that are of relevance when selecting our suppliers. In addition to the material quality and the technical characteristics, more than anything else we look at service orientation,” explains Dietmar Baur. “Flexibility is a major issue for our customers. In order to be able to do and act in line with this, we need partners we can rely on, who are also able to react quickly.” Here, the Director of Purchasing for two important business units at MANN+HUMMEL is aware of the fact that the lead times typical in the steel industry can, at times, pose a challenge for manufacturers when it comes to responding flexibly.

Response capabilities are crucial: the global market for filtration is characterized by predatory competition, with numerous manufacturers seeking to get a slice of the € 40 billion in revenue shifted

annually within the global industry. “Consequently, the processes simply have to be correct, and everyone involved in the supply chain needs to meet the necessary requirements regarding speed and quality if joint success is the goal,” Baur adds. This applies to all four divisions at MANN+HUMMEL: Automotive Original Parts, Automotive Aftermarket, Industrial Filtration and Water Filtration. As material group manager at MANN+HUMMEL, Baur's colleague and co-worker David Vicente assumes an extremely important cross-sectional function: he is “the” go-to person at the filter producer when it comes to the topic of steel. In tandem with Dietmar Baur, he ensures that, on a strategic level, the right partners are found when selecting suppliers, partners who will ensure that general corporate objectives can be achieved. At the same time, David Vicente follows market place developments and, as the responsible ▶

▶ The MANN+HUMMEL Marklkofen plant:
Non-stop steel



“Material Group Manager”, provides important impetus to the entire MANN+HUMMEL purchasing organization.

It is Vicente who ultimately breaks down the strategic targets in the operational business into the individual projects. His seventeen years of work at MANN+HUMMEL ensure that he performs this task with the requisite experience and keeps the supplier portfolio consistent.

“We have a total of 280 buyers among the company's 60 locations and approximately 15,200 employees worldwide. All of them must have internalized the MANN+HUMMEL approach so that we're all pulling in the same direction,” explains Vicente regarding the approach. This approach, which above all reflects a commitment to quality, also played a part when contacting Salzgitter AG. Just as customers evaluate the filter manufacturer's performance, suppliers are systematically analyzed on the basis of key performance indicators. However, before the actual co-operation and assessment came about, less stringent criteria were applied which were consistently weighted. Dietmar Baur explains: “Our co-operation with Salzgitter AG is still young, with the company being one of our suppliers since 2010. In particular, the decision to integrate the Karlsruhe-based Salzgitter Mannesmann Stahlservice, or SMS for short, into the group consortium had a positive effect on the decision in favor of Salzgitter.”

For Vicente, it is important to be able to rely on the combination of a manufacturer with technologically high-quality steel products who also has the clear service orientation of a steel service center: “Previously, we had never specifically focused on Salzgitter as a contact point. The assumption of SMS opened up new perspectives:

We found the prospect of a steel service center with a direct connection to the manufacturer very interesting, because we expected that this would, on the one hand, meet our expectations for service orientation and flexibility, as well as enable us to develop direct contact with the smelter.” Dietmar Baur explains: “The competitive plant in Karlsruhe was another factor that made the decision easy for us. And now we can also fall back on the technological know-how and Salzgitter Flachstahl GmbH”. Face-to-face talks with management in Karlsruhe and Salzgitter quickly showed that the new configuration can rely on continuity - something that's highly appreciated at MANN+HUMMEL. ▶

Given the scale at which MANN+HUMMEL produces its products, the reliability which this combination offers with respect to processes, as well as flexibility in service and development, are key requirements. At the Bavarian site of Marklkofen alone, 259,000 spin-on filters are turned out each production day. "That's 3 per second," explains Vicente, putting the high output into perspective. That makes a total of 60 million spin-on filters per year which leave the production site in southern Germany. Together with other product groups, the output adds up to 160 million filters which are produced annually in Marklkofen – and 500 million worldwide at all locations. "That's 16 per second" as Vicente explains.

At the same time, the steel, which is installed in large quantities, remains entirely unseen. By way of example, the company's own MANN-FILTER brand spin-on filters are not visible to the naked eye on the outside. These are products in which the quality and durability of the individual parts is crucial: "As a product, the spin-on filter has virtually reached the limits of development, since in principle it has been constructed the same way for decades," says Dietmar Baur. "So there's potential for optimization and savings with respect to the materials that are built into it. Traditionally used steel is competing with innovative and durable plastics. However, there is currently no alternative for steel, because in the long run pressure peaks are better tolerated in engines with filter solutions featuring steel components". As a result, besides the filter media, steel is the most important material at the Marklkofen plant.

Here, while MANN+HUMMEL can also rely on hot-rolled and cold-rolled strip from Salzgitter, above all it relies on electrolytic and hot-dip galvanized steels. "The Salzgitter portfolio fits very well with our requirements. We find the right products which we can process further," says Vicente. 57 % of the volume used is surface-refined steels. "The presence in all material groups was also a reason for our decision to work with Salzgitter AG". As a rule, the flat steel is subjected to forming processes such as stamping and deep-drawing – here, too, the Ludwigsburg-based company gladly resorts to Salzgitter's know-how.

Baur and Vicente point to the systematic performance assessment of their suppliers to underscore the fact that the dialog between MANN+HUMMEL and the supplier tandem of SMS and Salzgitter Flachstahl is perceived as one of added value. "We can now say quite clearly: SMS has worked out so well with us above all because, as a partner, it clearly performs above-average when it comes to the "partnership" aspect. This orientation towards partnership is why we want to further expand our co-operation". MANN+HUMMEL's vendor rating system allows all suppliers to see how they themselves are evaluated – there's both feedback as well as encouragement.

A total of 10 percent of the funds that go towards purchasing steel in Europe in the "Automotive Aftermarket" segment are directed to the SMS/Salgitter Flachstahl team. This number has only been able to be achieved within such a short time thanks to an intensive, partnership-based and



▲ **Dietmar Baur**
Vice President Purchasing
Automotive Aftermarket / Industrial
Filtration



▲ **David Vicente**
Director Material Group Steel

trusting relationship." Worldwide, steel is among the MANN+HUMMEL procurement segments which exceed the € 100 million mark annually.

Looking at the global markets, Dietmar Baur sees growth above all outside of Europe: "Disproportionate growth is being registered in Asia, while the "Americas" are growing strongly." The global purchasing volume of MANN+HUMMEL amounted to some € 1.9 billion in 2013, of which 68 % was accounted for by production materials. "As Director Material Group Steel, given this volume I need to control extensive material flows while also balancing the needs between the business areas. The goal is healthy internal competition," says Vicente, describing further aspects of his area of responsibility. "To the extent that we can fall back on dependable suppliers such as SMS and Salzgitter Flachstahl, this makes the task that much easier and enables us to achieve overall success," adds Baur.



▲ MANN+HUMMEL filters: nothing works without electrolytically galvanized steel

VARIETY IN NUMBERS

Strip up
to 0.12 in.
thick can be processed in the
electrolytic galvanizing lines

The strip passes through
up to 8
surface inspection systems and test
stands before the end product is pro-
duced, an electrolytically galvanized coil

Up to 38 %
more components from a coil thanks
to wastage optimization

Engine hoods
72.83 in.
wide can also be produced with mini-
mal wastage

We've delivered
2 million tons
of electrolytically galvanized
sheet since 2008



Names show profile.

THE NEW NAME ARCHITECTURE OF SALZGITTER FLACHSTAHL



Steel is still material number one. But all steel is not the same. The name itself gives this away: Steel products used in industry have different names which take their cue from the specific material properties.

We've developed a new naming concept for selected highlight brands of Salzgitter Flachstahl that follows a clear system. The system helps our customers and employees to optimally understand our growing product portfolio.

Consistent design principle

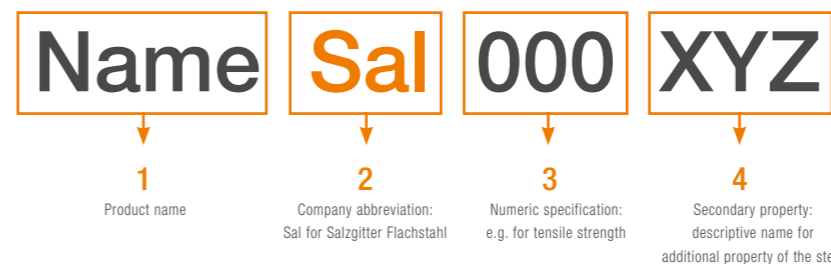
In forming nomenclature, we've drawn on the world of trees and the material wood, which has been used for millennia. Steel and wood share more than you might expect at first glance – both in terms of their fundamental material properties as well as in the ecological sustainability of the materials.

Each name is intended to identify a new product as a member of a larger product family, include a consistent company identifier and highlight the most important characteristics. In many cases, entire bundles of technical features can be linked with each other in a manner that can easily be spoken. Finally, the name is intended to express the character of the brand.

▲ The wood of trees is comparable to steel in many ways: it is ecologically sustainable, can be processed in optimal fashion and its material properties are as versatile as those of steel.



The design concept for Salzgitter Flachstahl's highlight brands is based on four "building blocks" which are always arranged in the same order:



In a nutshell – the secondary property:

For this, we use abbreviations whose meaning indicates the property to be highlighted. The abbreviation "seca" is derived from the Latin "secare" = to cut. The material S355MC is known for its good processing properties when processed by laser, plasma or water jet cutters. Therefore, the complete name for the steel grade is S355MCseca®. Another example: In order to highlight the hole expansion, the *xpand*® abbreviation is affixed to the steel name, as in *HCT600DXpand*®.

HERE BELOW WE INTRODUCE HIGHLIGHT BRANDS BASED ON THE NEW NAMING CONCEPT.

TektoSal®400

This name replaces ASH400 – a steel with extremely high surface hardness and wear resistance (HBW400). The choice of the name reflects the properties of tropical teakwood, in Latin "tectona grandis". As the sound of the Name already suggests, the teak tree provides particularly robust and durable wood.

AndroSal®960

AndroSal®960 replaces the standard appellation S960MC/QL. This is a water quenched steel grade whose material properties are distinguished by super high strength. "Andro" is derived from the Latin "androanthus impetiginosus" for the South American lapacho tree, which has one of the hardest woods of all trees.

RobuSal®800

This name replaces the brand name LH800®, a steel distinguished by extreme stability and fatigue strength. Here, we make use of the name of the black locust tree, in Latin "robinia pseudoacacia". The black locust provides extremely hard and tough wood that is extremely durable and expresses the material characteristics of this steel.

1 Product name.

The first part expresses the dominant property of the steel. It is derived from the Latin name for the chosen tree.

2 The Salzgitter Flachstahl company.

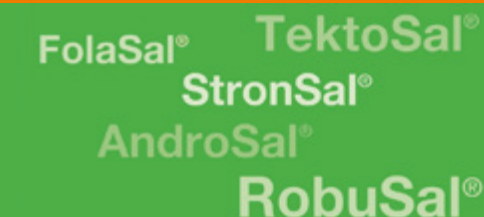
The second is "Sal", designating Salzgitter Flachstahl. It is the mainstay of the name architecture and remains unchanged in all Salzgitter highlight brands.

3 Specification.

Thirdly, a numerical feature follows. It serves to e.g. specify the yield strength or tensile strength of the steel.

4 Secondary property.

As a last step – if necessary – another important material property is mentioned. It serves to determine the particular steel in even more precise manner.



◀ Tectona grandis/
Teak tree



◀ Androanthus
impetiginosus/
Lapacho tree



◀ Robinia pseudoacacia/
Black locust tree

Wider. Thicker. Stronger.

SALZGITTER FLACHSTAHL'S ELECTROLYTIC GALVANIZING CAN DO MORE

In electrolytic galvanizing, a zinc layer is applied to steel plate under the influence of an electric field. The previously cleaned strip runs through 17 electrode cells and is coated with zinc on one or both sides. This coating consists of a layer of almost 100 % pure zinc. By precisely controlling the belt speed and current strength, zinc layers can be adjusted with extreme precision to be between 98.4 to 590.6 µin. for each of the two sides.

Last year, Salzgitter Flachstahl invested in electrolytic galvanizing and is offering customers an enhanced range of dimensions and quality. It is now possible to produce dimensions of up to 0.12 in. in thickness with a width of 72.83 in. This especially opens up many new possibilities in the area of electrolytically galvanized hot strip.

Salzgitter Flachstahl is also meeting the requirements for electrolytically galvanized, higher-strength hot and cold strip. We are not only able to produce structural steels and deep-drawing products, but also steel grades with high yield strengths for cold forming, and isotropic steel grades in an expanded dimension spectrum of 0.12 in. thickness and 72.83 in. width.

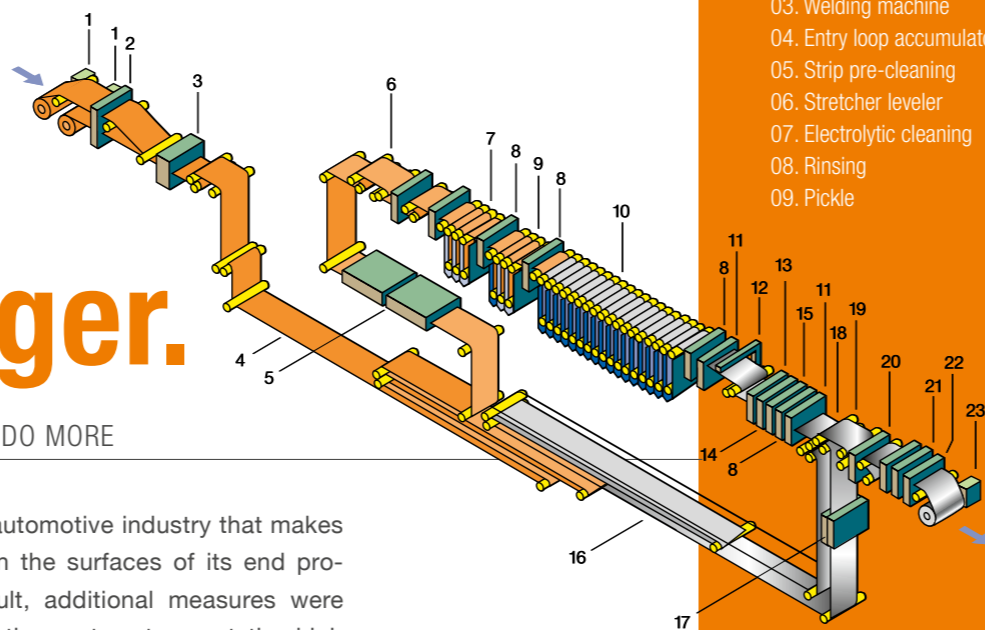
The strip tension required for materials with larger cross-sections and higher strengths was enabled by increasing the driving capacity of the so-called S-roller blocks. A new strip control system also optimized the process reliability.

It's not only the automotive industry that makes high demands on the surfaces of its end products. As a result, additional measures were implemented on the system to meet the high quality requirements in this segment. The construction of an oil supply station adds the application of various types of oil, including dry lubricants (hotmelt, drylube).

The lubricants reduce the friction between tool and steel sheet during the forming process and can now be applied according to individual customer specifications.

In order to guarantee high-quality surfaces, Salzgitter Flachstahl has continuously developed its surface inspection systems (SIS). A high-power LED light bar was installed. Higher-resolution camera technology improves detection and classification performance. At the same time, the system was enhanced by the addition of an online roughness measurement.

This permits non-contact laser measurement of the strip roughness over the entire strip length. Word of such investments has a way of getting out: the electrolytic galvanization performance is so convincing that even higher-strength hot-rolled strip with a tensile strength of up to 1,400 MPa was galvanized in the electrolytic galvanizing line at Salzgitter Flachstahl.



- 01. Uncoiling
- 02. Cropping shear
- 03. Welding machine
- 04. Entry loop accumulator
- 05. Strip pre-cleaning
- 06. Stretcher leveler
- 07. Electrolytic cleaning
- 08. Rinsing
- 09. Pickle
- 10. Electrolytic galvanizing with 17 cells
- 11. Dryer
- 12. Zinc coating thickness measurement
- 13. Activation
- 14. Phosphating
- 15. Passivation (chromium-free)
- 16. Exit-section looper
- 17. Inspection station
- 18. Surface inspection system
- 19. Roughness measurement
- 20. Trimming shear
- 21. Electrostatic oiler
- 22. Oiling gauge
- 23. Reeling process

Material-efficient production of outer skin parts

Manufacturing requirements

Material savings and resource conservation

- ▶ Sustainable production

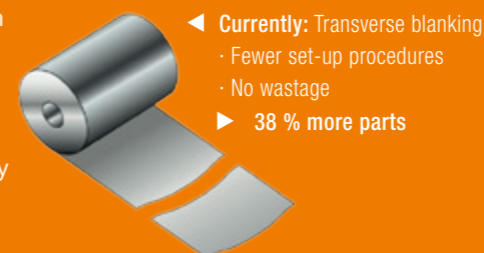
Modernization of plant engineering

Increase producible strip width to a maximum 72.83 in.

- ▶ High material efficiency thanks to wastage-optimized workpiece geometry for large components



◀ So far:
Longitudinal blanking



◀ Currently: Transverse blanking
· Fewer set-up procedures
· No wastage
▶ 38 % more parts

▶▶▶ Information

Upon request, Salzgitter Flachstahl's electrolytically galvanized coils can be given surface protection such as oiling, phosphating and chemical treatment, or a combination thereof. This protection helps to prevent the risk of oxidation or white rust formation due to moisture on the surface during transport and storage. This protection has a limited lifespan.

- ▶ Oiled
Prelube, Hotmelt
- ▶ Phosphated
Phosphated and chemically treated
- ▶ Chemically passivated
Chemical passivation temporarily protects the surface against corrosion during storage and transportation.



▲ A view of the plant reveals its vast dimensions.



▲ A loop accumulator ensures continuous processing of the material.



▲ The inline strip inspection guarantees the consistently high quality of the products.

PRETEX®

THE OPTIMUM BASIS FOR ALL OUR GALVANIZED STEEL STRIP



▲ **Inline roughness measurement:** State-of-the-art testing technology ensures maximum quality

The decisive advantage of the electrolytic galvanizing process compared to the hot-dip coating process is uniform and homogeneous galvanizing. Since the zinc layer thickness depends on the strength and duration of the current flow, irregularities are not filled up, but rather are reproduced at constant zinc layer thickness.

This means a depression which is present on the uncoated sheet metal before galvanizing also remains a depression on the galvanized sheet metal. Ultimately, the cold strip surface is replicated via the zinc layer. The structure on the cold steel sheet is therefore decisive for the structure on the electrolytically galvanized sheet metal. These struc-

tures are crucial for sliding during deep-drawing. Ever more complicated forming processes on modern deep-drawing presses are imposing rising demands on the tribological forming behavior of fine steel sheet. Consequently, Salzgitter Flachstahl, in collaboration with Salzgitter Mannesmann Forschung, has further optimized the proven PRETEX® process.

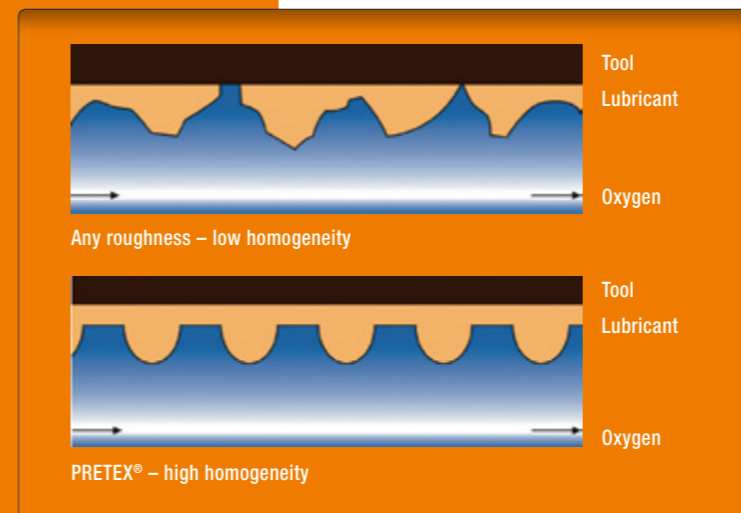
PRETEX® is a roller texturizing process for fine steel sheet surfaces for which particularly high paintwork as well as good deep-drawing properties are required. The deep-drawing and lacquer processes can be optimized via specific combinations of steel sheet topographies.



▲ Comparison of a PRETEX® working roll (background) and a conventional working roll



▲ Schematic representation of the process of applying the PRETEX® surface structure



▲ Friction between steel sheet and tool

This is enabled by a skin pass with textured work rolls. A work roll is employed to apply the surface structure to the uncoated fine sheet, which is adjusted in accordance with individual customer requirements. The density, number and depth of the calottes which result from this process directly influence subsequent processing properties.

Salzgitter Flachstahl's PRETEX® roll coating system is fundamentally different from conventional texturing processes. Conventional roll texturing processes deform the roll surface. This is either a plastic deformation caused by propelling a fine grain metallic blasting shot against the surface or is melted in part. Unlike conventional texturing processes, the PRETEX® process hard chrome plates the working roll surface electrolytically according to the patented TOPOCROM process.

Depending on the surface requirements, the system is filled with a defined concentration of chromium solution, which is deposited on the roller surface. This results in a wholly uniform distribution of the variously sized hard-chrome hemispheres. These can be selectively varied by size and number per unit of area and reproduced. Consequently, the roller roughness is adjusted to individual customer requirements and the surface structure of the steel strips is adapted to the particular application.

Any resulting surface pocket on the steel strip serves as a lubricant reservoir during deformation and significantly improves the friction and lubrication conditions. The increased surface roughness also prevents so-called cold welding, i.e. the fusion of the tool and sheet at very high blank holder forces.

Optical measurement methods are usually employed to assess the quality of the coating. The measurement methods distinguish between long-wave and short-wave components for the assessment of the structural proportions of a coating. Good paintability, together with a simultaneous reduction of the paint coating thicknesses, requires high peak counts and small long wave and short wave structure features in order to prevent what is known as "orange peel" in the topcoat of painted automotive panels. PRETEX® demonstrates clear advantages compared to conventional structures.



Work-hardening effect:
This is understood as the increase in strength resulting from the forming process (solidification).

Bake-hardening effect:
In contrast to the work hardening effect, the bake-hardening effect occurs as a result of the temperature effect in the course of baking on the lacquer coating.

Both together enable weight reduction by means of a reduction in thickness, without impairing the required component strength.

A specialist for every scenario

EXAMPLES OF THE WORKHORSE KNOWN AS STEEL

Modern steel materials are tasked to exhibit different properties depending on their application. Formability, stiffness and surface quality represent only a few examples of the criteria that are required as characteristic properties. As a result, some 2,500 steels with very different properties are now produced for a broad variety of applications. This is achieved by the interplay of the alloying elements and the type of process control employed.

The driving force behind the development of new vehicles is the reduction of CO₂ over the entire product life cycle of all products, as well as ever-increasing safety requirements. The sustainability of products plays an increasingly important role in production and in use.

Consequently, as a material, steel is faced with the challenge of achieving innovative design – e.g. via component integration – as well as continu-

ous development intended to make it lighter, yet still stronger. This is due to the fact that, in order to reduce CO₂ emissions, keeping total weight constant is no longer sufficient. On the contrary, efforts are directed toward reducing the overall weight of vehicles.

Electrolytically galvanized sheet represents an important contribution to this effort. These offer the advantage over hot-dip coated sheet that small zinc layer thicknesses can be achieved. In addition, total weight can be further reduced by the targeted design of the zinc layer thickness, e.g. both sides with equal zinc layer thickness, or a smaller zinc layer on the less stressed side, or only galvanized on one side. This represents a weight-saving potential that can contribute to the reduction of CO₂ emissions. Depending on the combination with steel grades, specialist steels can be produced for every application which feature additional potential for lightweight construction.

ELECTROLYTICALLY GALVANIZED BAKE-HARDENING STEELS – THE OUTER SKIN SPECIALISTS

Due to their thin layer of zinc and good forming characteristics, electrolytically galvanized bake-hardening steels are used particularly frequently for the outer skin of an automobile, e.g. doors (figure at left). This positions them as specialists for that first impression one gets of a car: the look.

The main component of bake-hardening steel is ferrite. This gives this steel grade its high, round n values. As a result, the steel exhibits good deep drawing properties that permit complex and demanding component geometries to be achieved.

But in contrast to most other ferritic steels, bake-hardening steels possess a special feature:

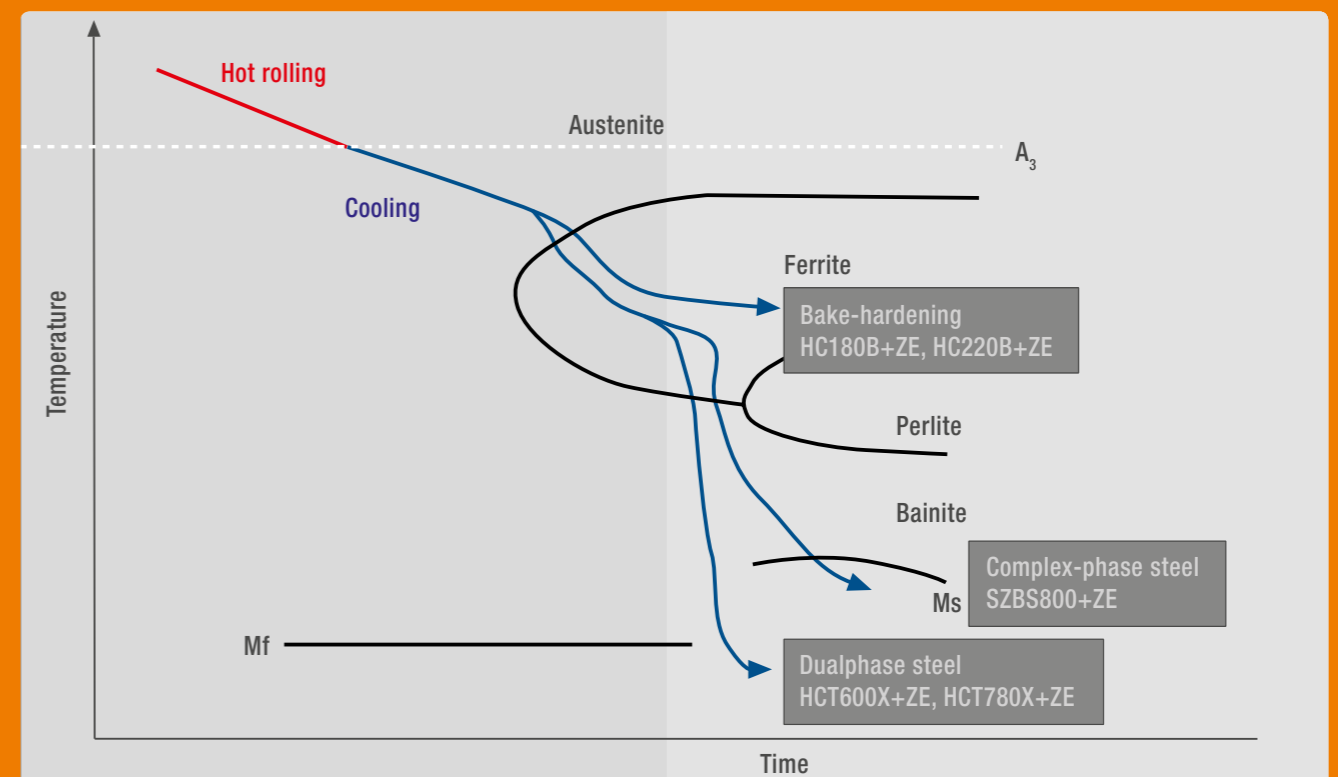
the production process in the automotive plant can be used in targeted manner to increase strength. When forming the component (the so-called work hardening effect occurs at this point, see box on the left) and the subsequent lacquer process (the so-called bake-hardening effect then follows), the material solidifies to its final stiffness. This means that bake-hardening steels can be readily formed during the manufacturing process, but feature high resistance to denting compared to other grades of steel thanks to precisely this stiffening. Consequently, automobile designers can draw up even more innovative and sophisticated designs for future cars ▶

Description	VDA239 –100 (longitudinal sample)	Yield strength R _{p0.2}	Tensile strength R _m	R-value R ₂₀	Total elongation A ₈₀	Hardening exponent n ₉₀	Bake-hardening BH ₂
HC180X+ZE	CR180 BH-EG	180 – 240 MPa	290 – 360	≥ 1.1	≥ 34 %	≥ 0.17	≥ 20 MPa
HC220X+ZE	CR210 BH-EG	210 – 270 MPa	320 – 400	≥ 1.1	≥ 32 %	≥ 0.16	≥ 30 MPa

Surface A and B,
with PRETEX® texturing, electrolytically galvanized (98.4 to 590.6 µin. one side/both sides/differential galvanization), optional: oiling (Prelube, Hotmelt), phosphated, chemically passivated

Range of dimensions
▶ thickness 0.02 to 0.08 in. (others on request)
▶ width 35.43 to 72.83 in. (depends on thickness)
▶ good weldability is achieved using all common methods.

Cooling strategies in time-temperature-transformation diagram





DUALPHASE STEELS – THE GENERALISTS

For nearly two decades, Salzgitter Flachstahl has been producing these generalist steels. For some time now, the advantage of these dualphase steels has also been able to be offered in tandem with the advantages of electrolytic galvanizing – an ideal combination for lightweight construction requirements and weight reduction.

The grades of steel have a dualphase structure with finely dispersed martensite in a ferritic basic matrix. As with bake-hardening steels, the ferrite ensures good formability, while the martensite provides increased strength. In combination, these turn our dualphase steels into an all-rounder. Despite their high strength, they are easy to form, permitting more complex component geometries than other grades of steel of the same strength.

At the same time, they exhibit a high solidification rate, since the component notches further gains in strength during the forming process. An additional increase in yield strength is achieved due to the effect of temperature when baking lacquer on the finished component. This makes dualphase steels ideal for components that require high strength, undergo a forming process and are subsequently lacquered under the effect of temperature. They are suitable both for complex structural components and for safety-related components.

In short:
Our all-rounder dualphase steel ensures that we'll arrive safely when we travel by car.

Description	VDA239 –100 (longitudinal sample)	Yield strength $R_{p0.2}$	Tensile strength R_m	Total elongation A_{80}	Hardening exponent n_{10-20/A_g}	Bake-hardening BH_2
HCT600X+ZE	CR330Y590T-DP-EG	330 – 430 MPa	590 – 700 MPa	≥ 20%	≥ 0.14	≥ 30 MPa
HCT780X+ZE	CR440Y780T-DP-EG	440 – 550 MPa	780 – 900 MPa	≥ 14 %	≥ 0.11	≥ 30 MPa

Surface A, with PRETEX® texturing, electrolytically galvanized (98.4 to 590.6 µin. one side/both sides/differential galvanization), optional: oiling (Prelube, Hotmelt), phosphated, chemically passivated

Range of dimensions
▶ thickness 0.03 to 0.08 in. (others on request)
▶ width 35.43 to 70.87 in. (depends on thickness)
▶ thanks to their alloy concept, electrolytically galvanized dualphase steels can be joined extremely well using common welding processes.

BAINITIC STEELS – THE ONES THAT LAST AND LAST

Bainitic steels belong to the group of complex-phase steels and owe their name to the more complex composition of their structural parts: besides martensite, as found in dualphase steels, bainite, perlite and retained austenite are also involved. Here, bainite is the characteristic microstructure of bainitic steels.

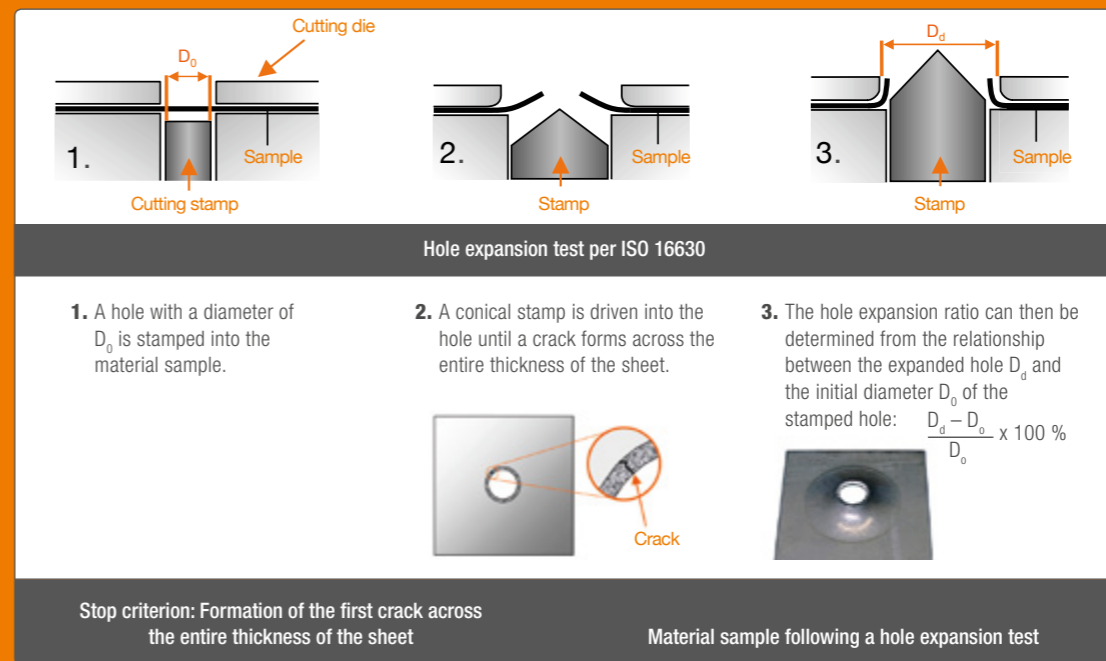
Bainite causes the complex-phase steels to exhibit slightly higher yield strength at the same tensile strength, and somewhat less total elongation than dualphase steels. They are important when higher yield strength with a higher fatigue strength is essential for component properties.

Consequently, it is ideal for use in components that are subject to varying loads, e.g. chassis components. Here, they can fully utilize an additional property: in comparison to other steel grades of the same strength, bainitic steels are easily formed and exhibit low edge cracking susceptibility as well as high bending angles. They consequently permit complex components, while also offering the potential for component integration.

Bainitic steels are the specialists for endurance which create completely new possibilities in the chassis.

Whatever your plans may be. Challenge us. We have the right steel for your applications.

Description	VDA239 –100 (longitudinal sample)	Yield strength $R_{p0.2}$	Tensile strength R_m	Total elongation A_{80}	Bake-hardening BH_2
SZBS800+ZE	CR570Y780T-CP-EG	570 – 720 MPa	780 – 920 MPa	≥ 10%	≥ 30 MPa



A special property of Salzgitter Flachstahl multiphase steels is the above-average capacity for hole expansion and the associated low susceptibility to edge cracks. For example, in the SZBS800 Salzgitter Flachstahl guarantees a hole expansion of 40 percent. This particular property allows for complex component geometries.

In addition, the guaranteed increased hole expansion means that risk of failure at the customer is reduced despite the reduced sheet thickness. The hole expansion capacity and thus the susceptibility to edge cracking are tested by a test method based on ISO 16630. This process is performed at Salzgitter Flachstahl and is recognized by leading automotive manufacturers. ◀

Surface A, with PRETEX® texturing, electrolytically galvanized (98.4 to 590.6 µin. one side/both sides/differential galvanization), optional: oiling (Prelube, Hotmelt), phosphated, chemically passivated

Range of dimensions based on hot strip
▶ thickness 0.07 to 0.1 in.
▶ width 35.43 to 59.05 in. (depends on thickness)
▶ good weldability is achieved employing all common methods.

Team Elo

YOUR SPECIALIST CONTACT PARTNERS



“Whatever your plans may be – we have the right steel for your applications.”

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“Maximum surface quality – sustainably developed.”

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